WHAT IS CLAIMED IS:

Sub A1

1. A method of forming a solution film on an in-process substrate by using a dropping section for dropping liquid and an in-process substrate just under said dropping section, maintaining the liquid dropped from said dropping section on said in-process substrate, and relatively moving said in-process substrate or said dropping section, wherein

relative movement between said in-process substrate and said dropping section means rotating said substrate and relatively moving said dropping section from an inner periphery of said substrate toward an outer periphery of said substrate;

relative movement between said in-process substrate and said dropping section means rotating said substrate and relatively moving said dropping section from an inner periphery of said substrate toward an outer periphery of said substrate for spirally dropping said liquid on said in-process substrate;

rotational frequency w for said substrate is decreased so that a centrifugal force applied to a dropped solution film should not move said dropped solution film in accordance with relative movement of said dropping section from the inner periphery of said in-process substrate toward the outer periphery and feed rate v for said liquid from said dropping section is increased to form a solution film on said in-process

substrate;

otherwise,

relative movement between said in-process substrate and said dropping section means rotating said substrate and relatively moving said dropping section from said outer periphery of said substrate toward said inner periphery of said substrate;

relative movement between said in-process substrate and said dropping section means rotating said substrate and relatively moving said dropping section from an outer periphery of said substrate toward an inner periphery of said substrate for spirally dropping said liquid on said in-process substrate; and

rotational frequency w for said substrate is increased so that a centrifugal force applied to a dropped solution film should not move said dropped solution film in accordance with relative movement of said dropping section from the outer periphery of said in-process substrate toward the inner periphery and feed rate v for said liquid from said dropping section is decreased to form a solution film on said in-process substrate.

2. The film formation method according to claim 1, wherein when said dropping section is positioned to distance r from a center of said in-process substrate, feed rate v for said liquid from said dropping section is determined in accordance with

rotational frequency w for said in-process substrate so that a constant value is maintained for the product of rotational frequency w by feed rate v of said substrate support.

3. The film formation method according to claim 2, wherein rotational frequency w0 is assumed for an in-process substrate when said dropping section is positioned to radius R on said in-process substrate and feed rate v0 is assumed for said liquid when said dropping section is positioned to distance r from a center of said in-process substrate center; and

when said substrate is positioned to said distance r, rotational frequency w for said substrate is determined by the product of the square root of (R/r) by w0 and feed rate v is determined by v0 divided by the square root of (R/r).

Sub A27

4. The film formation method according to claim 1, wherein when said in-process substrate is a disk-shaped substrate with radius R (mm), said dropping section drops liquid at the outmost periphery of said substrate and a rotational frequency (rpm) for said substrate is smaller than the square root of 1,000,000/R.

5. The film formation method according to claim 4, wherein when said in-process substrate is a disk-shaped substrate 200 mm in diameter, said dropping section drops liquid at the outmost periphery of said

substrate and a rotational frequency for said substrate is 99 rpm or less.

6. The film formation method according to claim 4, wherein when said in-process substrate is a disk-shaped substrate 300 mm in diameter, said dropping section drops liquid at the outmost periphery of said substrate and a rotational frequency for said substrate is 81 rpm or less.

7. The film formation method according to claim 1, wherein relative movement of said dropping section from an inner periphery to an outer periphery or from an outer periphery to an inner periphery of said in-process substrate is controlled to move for a specified pitch per revolution of said substrate.

8. The film formation method according to claim 1, wherein said dropping section includes a plurality of discharge openings for discharging liquid; and

a discharge rate of said dropping section and a rotational frequency of said in-process substrate are determined by an average of displacements for a plurality of discharge openings.

9. The film formation method according to claim 1, wherein relative movement of said dropping section from the inner periphery of said in-process substrate toward the outer periphery corresponds to the relative movement of said in-process substrate from an

approximate center toward the outer periphery; and

relative movement of said dropping section from the outer periphery of said in-process substrate toward the inner periphery corresponds to relative movement of said in-process substrate from the outer periphery toward an approximate center.

10. The film formation method according to claim 1, wherein a region including an approximate center of said in-process substrate is used in such a manner that said dropping section moves in a column direction from one end to the other in said region including an approximate center and moves in a row direction outside said region including an approximate center based on the relative movement between said in-process substrate and said dropping section, and said dropping section supplies said in-process substrate with solution at feed rate v' to form a solution film.

11. The film formation method according to claim 1, wherein said feed rate v' is set so that it almost equals feed rate v for liquid spirally dropped just outside said region including an approximate center.

12. The film formation method according to claim 1, wherein a region including an approximate center on said in-process substrate prevents a solution film from moving due to a centrifugal force applied to a dropped solution film by partially blocking liquid

discharged from said dropping section so as not to reach said in-process substrate for droplet amount adjustment.

13. The film formation method according to claim 1, wherein said liquid is one selected from the group consisting of a solution containing anti-reflection used for an exposure process, a solution containing photosensitive material, a solution containing low-dielectric material, a solution containing ferroelectric material, a solution containing electrode material, solution containing pattern transfer material, a solution containing magnetic material used for a disk-shaped storage medium, and a solution containing a light absorptive/reactive material used for a disk-shaped storage medium.

14. The film formation method according to claim 1, wherein said in-process substrate with said solution film formed thereon is exposed under a pressure lower than a steam pressure at a process temperature for a solvent in said solution film, and said solvent is dried and removed to form a solid layer.

15. The film formation method according to claim 14, wherein said formed solution film is dried with vibration applied to form a solid layer having an almost flat surface.

16. The film formation method according to claim 1, wherein said in-process substrate with said solution film formed thereon is exposed to a current of air to dry and remove solvent in said solution film for forming a solid layer.

17. The film formation method according to claim 16, wherein said formed solution film is dried with vibration applied to form a solid layer having an almost flat surface.

18. A method of manufacturing a semiconductor element for forming said solid layer on said in-process substrate by using the film formation method described in claim 14, wherein

said in-process substrate is a semiconductor substrate and said solid layer is selected from at least one of an anti-reflection photosensitive film used for an exposure process, a low-dielectric film, an inter-layer insulator, a ferroelectric film, an electrode, and a pattern transfer film.

19. A semiconductor element formed by using the semiconductor element manufacturing method described in claim 18, wherein said semiconductor element includes at least one of an anti-reflection photosensitive film used for an exposure process, a low-dielectric film, an inter-layer insulator, a ferroelectric film, an electrode, and a pattern transfer film on said semiconductor substrate.

20. The method of manufacturing a semiconductor element forming said solid layer on said in-process substrate by using the film formation method described in claim 16, wherein

said in-process substrate is a semiconductor substrate and said solid layer is selected from at least one of an anti-reflection photosensitive film used for an exposure process, a low-dielectric film, an inter-layer insulator, a ferroelectric film, an electrode, and a pattern transfer film.

21. The semiconductor element formed by using the semiconductor element manufacturing method described in claim 20, wherein said semiconductor element includes at least one of an anti-reflection photosensitive film used for an exposure process, a low-dielectric film, an inter-layer insulator, a ferroelectric film, an electrode, and a pattern transfer film on said semiconductor substrate.

22. The method of manufacturing a disk-shaped storage medium forming said solid layer on said in-process substrate by using the film formation method described in claim 14, wherein

said solid layer is a magnetic film or a light absorbent/reactive film.

23. The method of manufacturing a disk-shaped storage medium forming said solid layer on said in-process substrate by using the film formation method

described in claim 16, wherein

said solid layer is a magnetic film or a light absorptive/reactive film.